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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/489,356	01/21/00	SHIH H	AM-1622.D1

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EXAMINER	
ZERVIGON,R	
ART UNIT	**PAPER NUMBER**
1763	9

DATE MAILED: 08/08/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.	Applicant(s)
09/489,356	Shih, et al
Examiner	**Art Unit**
Rudy Z rvigon	1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on Jul 16, 2001

2a) ☐ This action is **FINAL.** 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-23 is/are pending in the applica

4a) Of the above, claim(s) _____ is/are withdrawn from considera

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 1-23 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirem

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☒ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☐ Notice of References Cited (PTO-892)

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____

18) ☐ Interview Summary (PTO-413) Paper No(s). _____

19) ☐ Notice of Informal Patent Application (PTO-152)

20) ☐ Other:

DETAILED ACTION

Response to Request for Reconsideration

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1, 2, 7, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP363203098A in view of Kramer et al (U.S.Pat. 5,271,967). JP363203098A teaches a method of coating an aluminum-based member ("substrate") of substantially pure aluminum ("made of aluminum or the like", abstract) with boron carbide via thermal spray (abstract).

However, JP363203098A does not teach in the abstract the method step of surface preparation where "roughening a surface of a substrate to a value of surface finish R_a of at least 2.5μm".

Kramer et al teaches a method and apparatus for coating engine blocks via thermal spray (column 2, lines 54-58). Specifically, Kramer et al teaches the method step of surface preparation where roughening a surface of a substrate ("cylinders") to a value of surface finish R_a of at least 2.5μm". Here, "mean peak-to-peak distances of up to 50μm" is interpreted as $R_a \geq 2.5\mu m$.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to preprocess the surface to be coated with boron carbide by "roughening a surface of a substrate to a value of surface finish R_a of at least 2.5μm" as taught by Kramer et al (U.S.Pat. 5,271,967).

Motivation for preprocesing the surface to be coated with boron carbide by "roughening a surface of a substrate to a value of surface finish R_a of at least 2.5μm" as taught by Kramer et al (U.S.Pat. 5,271,967) is drawn to "provides increased surface area and surface irregularities ....provide a superior basis for bonding and anchoring the coating to the casting." (Column 2, lines 54-58).

4. Claims 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP363203098A in view of Kramer et al (U.S.Pat. 5,271,967) as applied to claims 1, 2, 7, and 8 above and further in view of Kmetz et al (U.S.Pat. 5,429,870). Both JP363203098A and Kramer et al (U.S.Pat. 5,271,967) do not teach CVD coating of boron carbide. Kmetz et al teaches CVD coating of boron carbide (column 1, lines 32-36).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement CVD deposited boron carbide as taught by Kmetz et al.

Motivation for implementing CVD deposited boron carbide as taught by Kmetz et al is drawn to its resistance to oxidation (column 1, lines 34-37).

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP363203098A in view of Kramer et al (U.S.Pat. 5,271,967) as applied to claims 1, 2, 7, and 8 above, and further in view of Howard Mizuhara et al. Both JP363203098A and Kramer et al (U.S.Pat. 5,271,967) do not teach a forming step comprising "surface conversion". Howard Mizuhara et al teaches a forming step comprising surface conversion, as defined by page 16 of the specification, such that a chemical reaction or "conversion" of the ceramic surface is achieved to deposit a sealing aid used form the metal/ceramic seal. This is described by Howard Mizuhara et al according to the "active brazing process" (right column, page 504). Specifically, Howard Mizuhara et al teaches "wetting the ceramic material is accomplished by the chemical reaction of the active element with the ceramic" (right column, page 504).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement Howard Mizuhara et al's active brazing process prior to the forming of the ceramic (boron carbide) layer. Where the forming of the boron carbide layer comprises surface conversion of the ceramic such that a chemical reaction or "conversion" acts to deposit a sealing aid used form the metal/ceramic seal. This is described by Howard Mizuhara et al according to the "active brazing process" (right column, page 504). Specifically, Howard Mizuhara et al teaches "wetting the ceramic material is accomplished by the chemical reaction of the active element with the ceramic" (right column, page 504).

Motivation for implementing the Howard Mizuhara et al active brazing process prior to the forming of the ceramic (boron carbide) layer, is discussed by Howard Mizuhara et al. Specifically, Howard Mizuhara et al describes how active brazing can provide "a reliable joint between the ceramic and metal" (left column, last paragraph, pp.505).

6. Claims 5, 6, 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP363203098A in view of Kramer et al (U.S.Pat. 5,271,967) as applied to claims 1, 2, 7, and 8 above, and further in view of Srihari Ponnekanti et al. Both JP363203098A and Kramer et al (U.S.Pat. 5,271,967) do not teach more than a native oxide of aluminum intervenes between said substrate and said boron carbide layer.

Srihari Ponnekanti et al teach failure mechanisms of aluminum parts confined in plasma environments (section III.). Specifically, Srihari Ponnekanti et al teach no more than a native oxide of aluminum (Figure 1) intervenes over the "substrate", and anodizing the "substrate" to form an anodization layer (Figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to coat Srihari Ponnekanti et al's native oxide layer with boron carbide as taught by both JP363203098A and Kramer et al.

Motivation for coating Srihari Ponnekanti et al's native oxide layer with boron carbide as taught by both JP363203098A and Kramer et al is drawn to the advantages of the JP363203098A and Kramer

et al disclosures. Specifically, JP363203098A teaches "boron carbide is not decomposed at high temperature" (abstract) and Kramer et al teaches "oxidation resistance" (column 1, lines 34-36).

7. Claims 9-12, 14-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP363203098A in view of Kramer et al (U.S.Pat. 5,271,967) as applied to claims 1, 2, 7, 8, and 13 above, and further in view of J. Linke et al and Srihari Ponnekanti et al. Both JP363203098A and Kramer et al (U.S.Pat. 5,271,967) do not teach CVD and thermal spray of particles of B_4C. Both JP363203098A and Kramer et al do not teach removing a portion of the anodized layer from the aluminum substrate. Srihari Ponnekanti et al teaches removed portions of the anodized layer from the aluminum substrate as supported by Section III.A(3) - "Cracks" formed in the anodized film by "processing conditions". Linke et al reports the protection accorded to plasma facing surfaces of plasma confining chambers by applying CVD and plasma sprayed Boron-doped graphite layers to such surfaces ("Materials and Characterization", paragraphs 3-5; "Erosion Behavior", entire section). Specifically, J. Linke et al teach:

i. A method of coating boron carbide, as B_4C grains between B_4C and $B_{13}C_3$, (CVD, "Materials and Characterization", paragraphs 3-5; "B/C ratios" - first sentence; "low-pressure plasma spray" - 6th paragraph, left column , page 228) on an aluminum-based member ("Materials and Characterization", paragraph 4; "stainless steel", "Inconel 600" each are aluminum alloys

ii. Forming a boron carbide layer carbide upon the surface (CVD, "Materials and Characterization", paragraphs 3-5)

iii. The boron carbide layer of 25wt% of carbon relative to boron as represented by B_4C ("Materials and Characterization", paragraph 3)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to consider depositing B_4C grains or "particles" as taught by J. Linke et al atop aluminum based substrates ("stainless steel", "Materials and Characterization", paragraph 3).

Motivation for depositing B_4C grains or "particles" as taught by J. Linke et al is drawn to "significant improvement of plasma performance" of "plasma-facing components" ("Impurity Production of a Boronized Wall").

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. JP408176782A

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (703) 305-1351. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official after final fax phone number for the 1763 art unit is (703) 305-3599. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (703) 308-0661. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (703) 308-1633.

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